BACKBURNING AS AN ALTERNATIVE TO TRADITIONAL PRE-COMMERCIAL THINNING

By F. Thomas Lloyd and Thomas Waldrop

Two studies — at the USDA Forestry Science Laboratories in Macon, Georgia, and Charleston, South Carolina — suggest that the cost of pre-commercial thinning can be reduced with low-intensity prescribed burning.

Where its seeds fall on the bare ground in full sunlight, loblolly pine usually has no trouble establishing itself after a harvest. Unfortunately, from an economic viewpoint, this natural regeneration process is often too successful, resulting in over-stocking. Species such as pines that regenerate primarily from seed can produce too many seedlings.

If timber profits are important land management objectives, then dense pine stands should be thinned when they are young. Thinning concentrates growth on the trees left behind and reduces the time they take to grow to a merchantable size. Unfortunately, this kind of thinning, called pre-commercial thinning, produces no income because it must be done before any of the trees are large enough to be merchantable. To maximize profits, Tree Farmers can either take preventive actions to avoid overcrowding or lower thinning costs for stands that are already too dense. Here we will focus on lowering costs for Tree Farmers by using backburning to thin pine stands.

Pre-commercial Thinning When Pines Are Too Dense

Numerous studies have shown that pre-commercial thinning of natural loblolly pine stands is a sound investment. Two methods of pre-commercial thinning are common. Mechanical thinning uses heavy equipment to mow wide strips, leaving narrow strips of pine or pine and hardwood saplings. The second method, called hand thinning, entails the use of string-trimmer type saws to cut all trees except those pre-selected for size and spacing. Hand thinning gets the best results because it leaves an optimum number of desirable tree species; these trees are evenly spaced for better growth.

Although economic analysis show good results from both of these thinning methods, the costs are relatively high. Many Tree Farmers cannot afford this investment. Others are reluctant because there are risks that can negate or postpone the return on their investment. Perhaps Tree Farmers might be more willing to take the risk if the cost of pre-commercial thinning was lower.

Two studies suggest that the cost of pre-commercial thinning can be reduced with low-intensity prescribed burning. These studies were done at USDA Forestry Science Laboratories in Macon, Georgia, and Charleston, South Carolina.

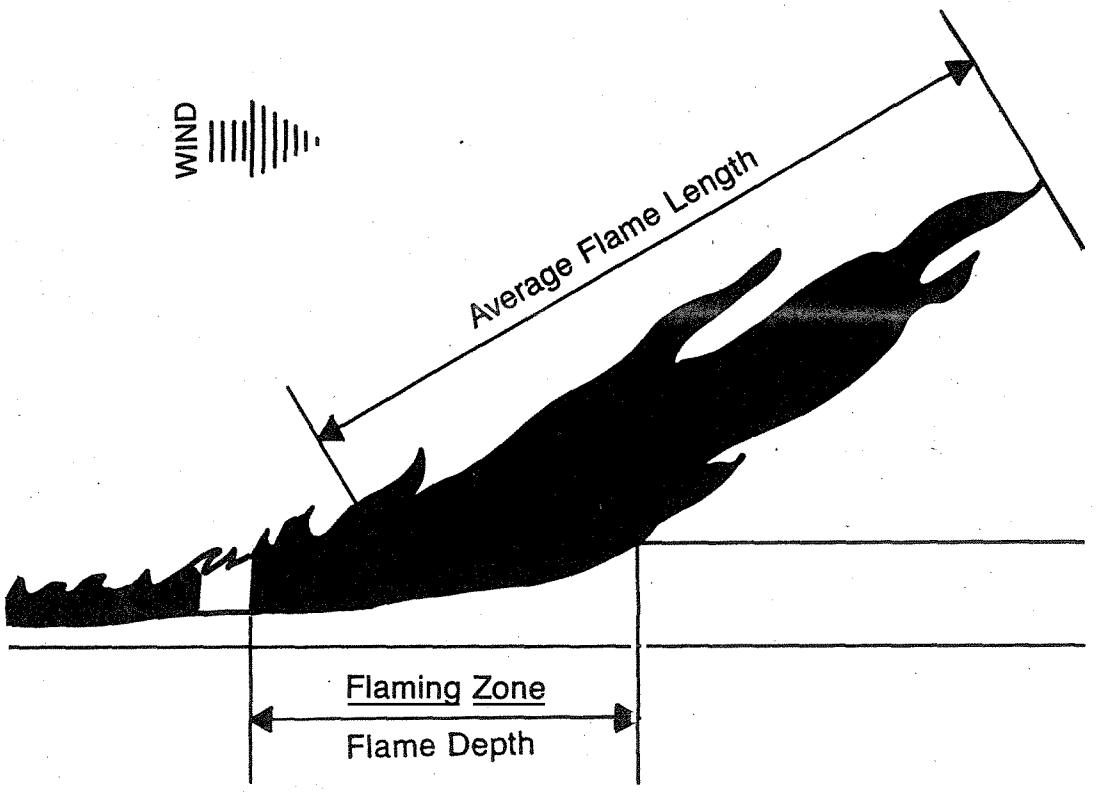
Because of the natural characteristics of Southern pine to develop a range of sizes (ground-line diameter and height) early in stand life (by age three to six), careful use of backburning fires can successfully thin dense stands. Burning kills many small trees but spares larger trees. The largest trees are often undamaged and will later become the crop trees.

Results of these two studies show that backing fires kill very few pine saplings with ground-line stem diameters over 1.5 inches. Below this threshold size, the smaller a sapling, the greater its probability of being killed. Backing fires are slower and more expensive than other firing methods. However, they are effective and their cost is a fraction (5 to 15 percent) of the cost of mechanical or hand thinning.

The timing of burning is critical, but depends more on tree size than tree age or the season. The ideal time for burning is

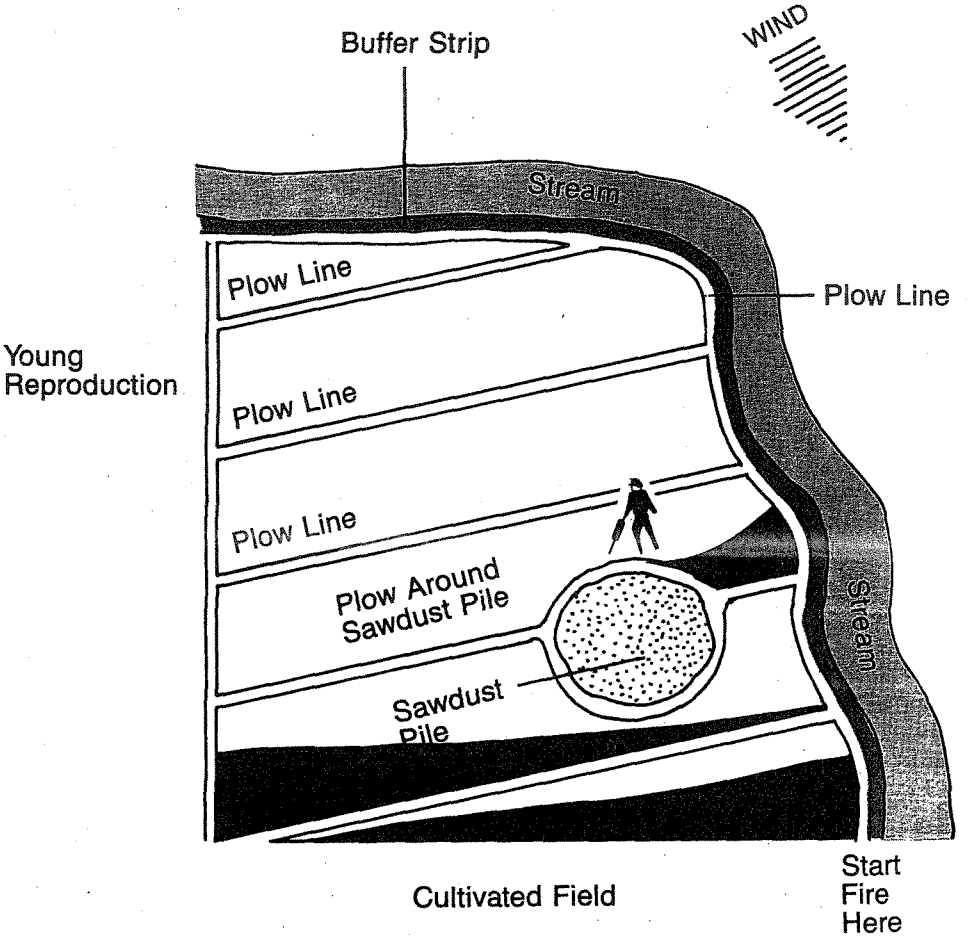
This dense stand had 6,500 stems per acre prior to burning.

BACKBURNING CONTINUED ... ON PAGE 3(



FLAME DIMENSIONS FOR A WIND-DRIVEN FIRE

A backing fire is started along a baseline such as a road, plow line, stream, or other barrier, and allowed to back into the wind. Backing fire is the easiest and safest type of prescribed fire to use, provided windspeed and direction are steady. In-stand winds of 1 to 3 mph at eye level are desirable, and dissipate smoke and prevent heat from rising directly into tree crowns. It produces minimum scorch and lends itself to use in heavy fuels and young pine stands. Major disadvantages are the slow progress of the fire and the increased potential for feeder-root damage with increased exposure to heat if the lower litter is not moist enough. When the relative humidity is low, a steady wind is blowing, and fuels are continuous, an excellent burn can be anticipated once the fire backs away from the downwind control line.



BACKING FIRE TECHNIQUE

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when enough trees reach 1.5 inches in diameter at the ground line to leave a fully stocked stand. Early tests of burning in stands with trees larger than 1.5 inches at the ground line were unsuccessful because low-intensity fires did not kill enough trees.

In the Charleston study, the trees were four years old. However, the best age for burning can be as young as three years or as old as eight years as long as sufficient numbers of trees are 1.5 inches in ground-line diameter. As might be expected, fires this close to the crowns of young trees will scorch the needles. It looks bad, but scorching usually does not kill pines. The main determinant of survival is ground-line stem diameter.

Although these results are promising, widespread application awaits further testing under a range of conditions. Land managers who have training and experience with prescribed fire can play an important role in testing this method by applying it in limited areas.

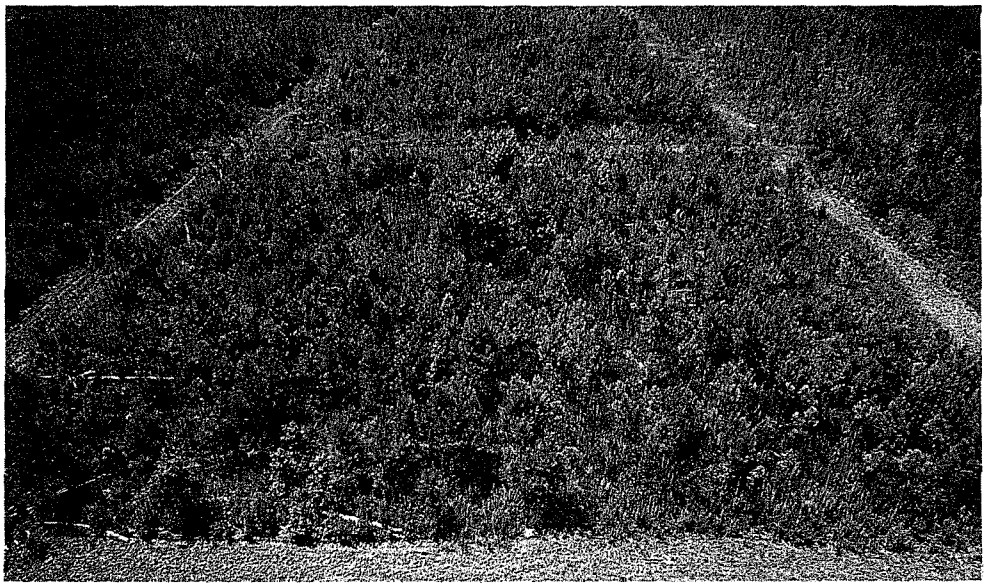
Economic Analysis

The Charleston study applied five pre-commercial thinning treatments including burning and hand thinning to very dense stands (8,000 to 12,000 pine saplings per acre) at age four. Tree growth was measured until age eight, when most of the trees were uprooted by Hurricane Hugo. Economic analysis were conducted by projecting the eight-year-old stands forward to age 30. Growth projections and economic comparisons were done with a computer growth-simulation model developed at Auburn University and based on data collected by the USDA Forest Service Forest Inventory and Analysis unit in Asheville, North Carolina. The purpose of these economic comparisons was to compare the two thinning treatments, not to predict actual income. It would be a mistake to compare these values with those of other forestry operations or other types of investments.

The economic analysis showed that both burning and hand thinning were good investments. Burning gave the highest internal rates of return (20.3 percent versus 13 percent for hand thinning), suggesting a greater return on each invested dollar. Both methods gave positive net present values (NPV), indicating that they are better choices than not thinning at all. The thinning method with the greatest NPV (indicating the most profit) depended on the discount rate used. At a discount rate of 4 percent, the NPV for stands thinned by hand was $512.91 per acre, as compared to $487.71 for stands thinned by burning. At the higher discount rate of 8 percent, hand thinning increased stand value (NPV = $148.87 per acre) but not as much as burning (NPV = $171.97 per acre). The low cost of burning, compared with the higher discount rate, made additional investment in hand thinning unnecessary.

Pre-commercial thinning of young dense loblolly pine stands can be a good investment. Hand thinning is expensive but it ensures that the best trees and the optimum numbers of trees are left standing. Prescribed burning looks promising and is much less expensive than hand thinning. However, burning allows very little control of tree spacing and its application is somewhat risky. It remains for land managers knowledgeable in the methods of prescribed burning to refine this promising field application.

Five weeks after burning. The trees have experienced severe crown scorch, which caused some loss of growth the year following burning.



The same area three months after burning. Scorched needles have fallen and new needles have emerged.

F. Thomas Lloyd is project leader and Thomas A. Waldrop is research forester with the Pine-Hardwood Research Unit of the USDA Forest Service, Southern Research Station, Clemson, SC.

PRESCRIBED BURN CONTINUED ... FROM PAGE 23

Photo: William Godfrey

Based on a combination of weather factors — including wind direction, speed, air temperature range, humidity, and soil moisture — fire managers can, to a great degree, control how hot a fire will become within a particular stand.

clean-up costs necessary to reforest your land. This savings can be between $40 and $100 per acre.

WHAT IS PRESCRIBED BURNING?

Prescribed burning is the application of fire to a forest stand in a defined area outlined by a firelane that has been established with either a bulldozer or a fire plow. We also use "wet lines" on Soliday Farms. "Because I seek to disturb the soil as little as possible, we often use 'wet lines' or control the fire with wet spray, rather than create firelanes," says Dr. Lambert. "Fewer firelanes mean less soil erosion after a burn."

The burn area has been previously identified on the management plan, and fire is applied under carefully chosen weather conditions based on the type of forest stand, brush, fuel, and surrounding hazards and the Tree Farmer's goals.

Based on a combination of weather factors—including wind direction, speed, air temperature range, humidity, and soil moisture—we can, to a great degree, control how hot the fire will become within a particular stand. The key is to analyze the area to be burned in advance, identify those things that cannot be controlled (such as type of fire fuel and timber), select the necessary weather conditions, and then simply listen to the radio regularly during the burning season. And when the proper weather conditions come about, complete the prescribed burn.

RISKS FROM BURNING

As in many investments, and most certainly in any agricultural crop, there is risk from prescribed burning. Specifically, it can be broken down into two areas:

- Fire escape onto adjoining properties of other private landowners.
- Risk of fire damage within the planned burn area or on other areas of the Tree Farm adjoining the burn area.

Adjoining Landowners — As do many forestry consultants, I carry liability insurance to pay for damages and cover lawsuits should a fire escape and cause damage on adjoining landowners' property. While there is a risk that an escape will occur within a course of prescribed burning, the risk of any serious damage is very small.

In any given year, Webb Forestry averages burning 60 tracts covering about 5,000 acres and usually has less than five "jumps." Of those, very few covered more than one acre and only one or two in our history did any measurable damage. In our almost 20 years of burning, Webb Forestry crews have only had one wildfire large enough to do any financial damage to timber of adjoining neighbors, and we paid for that damage.

Client's Adjacent Land — In this case, the risk is even more slight. In the almost 20 years and thousands of acres we have burned, we have only had three killing fires (i.e., hot enough to kill timber) on the property of our clients. None were major and the largest was eight acres. Total damage to any of our clients' property has been about 35 acres, which is a damage of less than .1 percent.

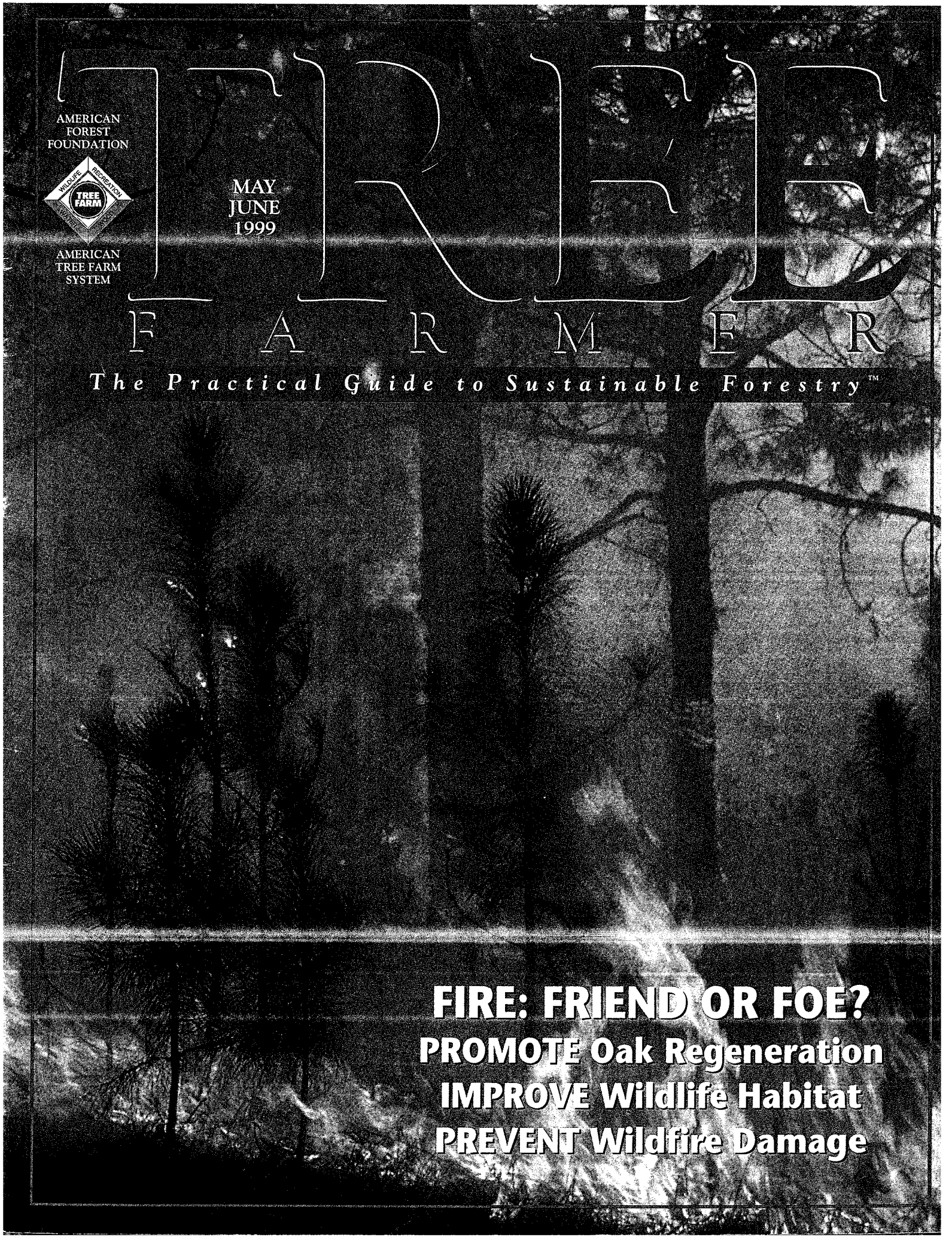
However, as with many forestry consultants, our insurance coverage does not include damage on the client's property. Tree Farmers should be aware that there is a risk to their properties, though it may be a small one, and should discuss this with their burning professionals. In our case, as outlined in our burning contract agreements, we limit our responsibility to the following:

- Handling of the salvage of any timber killed, at no charge.
- Pay the net cost (after cost-sharing) of site preparation and reforestation of the destroyed timber. It will be the responsibility of the Tree Farmer to apply for cost-share funds.

We take on this portion of the risk because we believe so strongly in prescribed burning. I cannot in good conscience be a good forestry manager without recommending prescribed burning and seeing that the necessary work is done. I believe the benefits to the Tree Farmer—in the gains in growth and wildlife habitat and the reduced risks of wildfires and beetle damage—make the risks worthwhile.

As a final note: Prescribed burning should always be conducted by professionals. Ask your forester to recommend sources of professional assistance.

Michael Webb, a member of the Association of Consulting Foresters, manages M.A. Webb Forestry Consultants of Columbia, Mississippi.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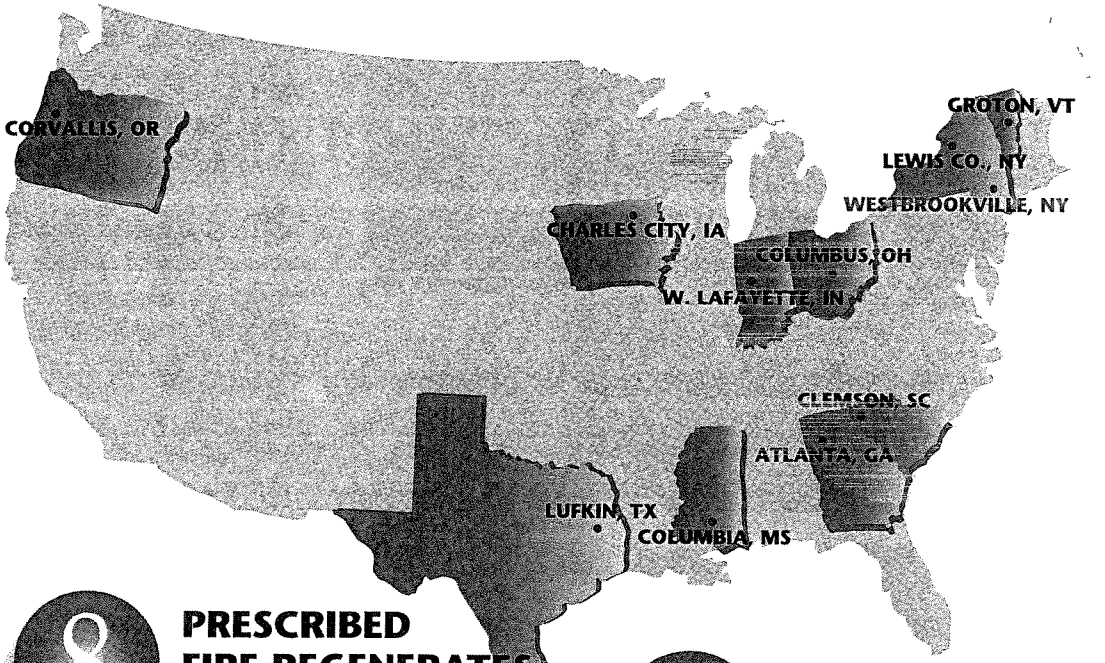

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